



TEST REPORT

Report Number: 102714365MIN-001
Project Number: G102714365

Testing performed on the
BTE13
Class II Permissive Changes

FCC ID: EOA-EXPSTANDARD

to
47 CFR Part 15.249:2015

For
Starkey Laboratories, Inc.

Test Performed by:
Intertek Testing Services NA, Inc.
7250 Hudson Blvd., Suite 100
Oakdale, MN 55128 USA

Test Authorized by:
Starkey Laboratories, Inc.
6700 Washington Avenue South
Eden Prairie, MN 55344, USA

Prepared by: Uri Spector
Uri Spector

Reviewed by: Norman Shpilsher
Norman Shpilsher

Date of issue: September 1, 2016

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.



TABLE OF CONTENTS

1.0	GENERAL DESCRIPTION.....	3
1.1	Product Description; Test Facility.....	4
1.3	Environmental conditions.....	5
1.4	Measurement uncertainty.....	6
1.5	Field Strength Calculation.....	6
2.0	TEST SUMMARY.....	7
3.0	TEST CONDITIONS AND RESULTS.....	8
3.1	Field strength of fundamental	8
3.2	Field strength of harmonics and spurious emissions.....	10
4.0	TEST EQUIPMENT.....	18
5.0	REVISION HISTORY.....	19

1.0 GENERAL DESCRIPTION

Model Tested:	BTE13
Type of EUT:	Hearing Aid
Serial Number:	161085203
FCC ID:	EOA-EXPSTANDARD
Related Submittal(s) Grants:	Class II Permissive Changes
Company:	Starkey Laboratories, Inc.
Customer:	Mr. Bill Mitchell
Address:	6700 Washington Avenue South Eden Prairie, MN 55344, USA
Phone:	(952) 947-4734
Fax:	(952) 828-6972
E-mail:	bill_mitchell@starkey.com
Test Standards:	☒ 47 CFR, Part 15:2015, §15.249 ☐ RSS-210, Issue 8, 2010 ☐ RSS-Gen, Issue 4, 2014 ☐ 47 CFR, Part 15:2015, §15.107 and §15.109, Class , test method: ANSI C63.4-2014 ☐ ICES-003, Issue 6:2016 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	August 31, 2016
Test Work Started:	August 31, 2016
Test Work Completed:	September 1, 2016
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good



1.1 Product Description; Test Facility

Product Description:	Hearing Aid Transceiver
Band of Operation:	902 - 928MHz
Operating Frequencies:	902.6-926.9MHz
Modulation:	FSK
Antenna(s) Info:	Integral
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter Power Configuration:	☒ Internal battery ☐ External power source ☐ 120VAC ☐ 230VAC ☐ 400VAC ☒ 1.45VDC ☐ Other: Amp. ☐ 50Hz ☐ 60Hz
Special Test Arrangement:	None
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2013

1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- ☐ - Standby
- ☐ - Continuous
- ☐ - Continuous un-modulated
- ☐ - Test program (customer specific)
- ☒ - Continuous modulated (see details below)

Operating modes of the EUT:

No.	Description
1	The device was pre-programmed to operate continuously at low, middle, and upper frequency channels, one channel being transmitted at a given time.

Cables:

No.	Type	Length	Designation	Note
1	None			

Support equipment/Services:

No.	Item	Description
1	None	

General Note: The only RF circuit change that has been made to the design was that antenna tuning capacitor C401 was depopulated. Therefore, Field Strength of Fundamental Emission and Spurious Radiated Emissions were measured.

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☒ **Normal**

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

1.4 Measurement uncertainty

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be: ± 4 dB at 10m and ± 5.4 dB at 3m

The expanded uncertainty ($k = 2$) for radiated emissions above 1GHz has been determined to be: ± 6.4 dB at 3m

The expanded uncertainty ($k = 2$) for conducted emissions from 150 kHz to 30 MHz has been determined to be: ± 2.6 dB

1.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB(m^{-1})

AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μ V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dB}$$

$$FS = RA + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V}/\text{m})$$

General notes:



2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.249(a)	Field strength of fundamental	Pass
15.249(a)	Field strength of harmonics	Pass
15.249(d)	Field strength of spurious emissions	Pass



3.0 TEST CONDITIONS AND RESULTS

3.1 Field strength of fundamental

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 902-928MHz

Test result: **Pass**

Max. Emissions margin at fundamental: 17.1dB below the limits

Notes: None



Date:	August 31, 2016	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC 15.249(a)	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	22.9°C; 47.8%(RH); 98.8kPa	
Equipment Verification:	☒	
Note:	None	

Table 3.1.1

Frequency MHz	Antenna		Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Reading dBμV	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
Polarity	Hts(cm)									
Channel 353										
902.58	V	129	22.0	2.6	0.0	52.5	77.1	94.0	-16.9	Peak Readings
902.58	H	204	22.0	2.6	0.0	48.3	72.9	94.0	-21.1	Peak Readings
Channel 393										
914.74	V	117	22.0	2.6	0.0	52.3	76.9	94.0	-17.1	Peak Readings
914.74	H	187	22.0	2.6	0.0	48.4	73.0	94.0	-21.0	Peak Readings
Channel 433										
926.85	V	110	22.0	2.6	0.0	49.2	73.8	94.0	-20.2	Peak Readings
926.85	H	190	22.0	2.6	0.0	45.3	69.9	94.0	-24.1	Peak Readings



3.2 Field strength of harmonics and spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 30MHz-10GHz

Test result: **Pass**

Maximum margin of harmonics and spurious emissions: 5.8dB below the limits

Notes: Transmitting fundamental frequencies and frequencies not related with transmitting operation were excluded from the table.

Graphs 3.2.1 and 3.2.2 show spurious and harmonics emissions for Channel 353

Graphs 3.2.3 and 3.2.4 show spurious and harmonics emissions for Channel 393

Graphs 3.2.5 and 3.2.6 show spurious and harmonics emissions for Channel 433

All peak harmonics and spurious emissions are below average limit.

Date:	August 31, 2016	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC 15.249(a)	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	22.9°C; 47.8%(RH); 98.8kPa	
Equipment Verification:	☒	
Note:	None	

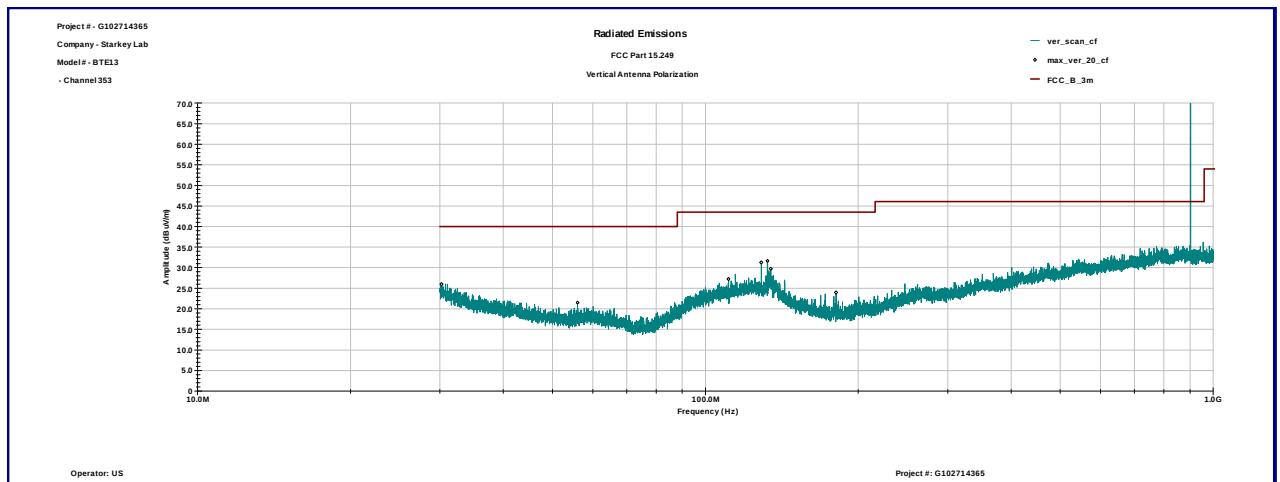
Table 3.2.1

Frequency MHz	Antenna Polarity	Peak Reading dBμV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
Channel 353							
1.738 GHz	V	48.1	28.6	43.0	33.6	54.0	-20.4
1.807 GHz	V	54.8	29.0	43.1	40.6	54.0	-13.4
1.924 GHz	V	49.1	29.8	43.2	35.7	54.0	-18.3
2.707 GHz	V	55.1	31.8	43.6	43.4	54.0	-10.6
1.807 GHz	H	51.7	29.0	43.1	37.6	54.0	-16.4
2.707 GHz	H	48.8	31.8	43.6	37.1	54.0	-16.9
Channel 393							
1.831 GHz	V	56.9	29.2	43.1	43.0	54.0	-11.0
1.924 GHz	V	51.9	29.8	43.2	38.5	54.0	-15.4
2.743 GHz	V	55.5	31.9	43.6	43.8	54.0	-10.2
1.831 GHz	H	52.2	29.2	43.1	38.3	54.0	-15.7
2.743 GHz	H	50.3	31.9	43.6	38.6	54.0	-15.4
Channel 433							
1.855 GHz	V	55.4	29.4	43.1	41.7	54.0	-12.3
1.924 GHz	V	47.9	29.8	43.2	34.5	54.0	-19.5
2.779 GHz	V	59.9	31.9	43.6	48.2	54.0	-5.8
1.855 GHz	H	52.2	29.5	43.1	38.6	54.0	-15.4
2.779 GHz	H	54.4	32.0	43.6	42.8	54.0	-11.2

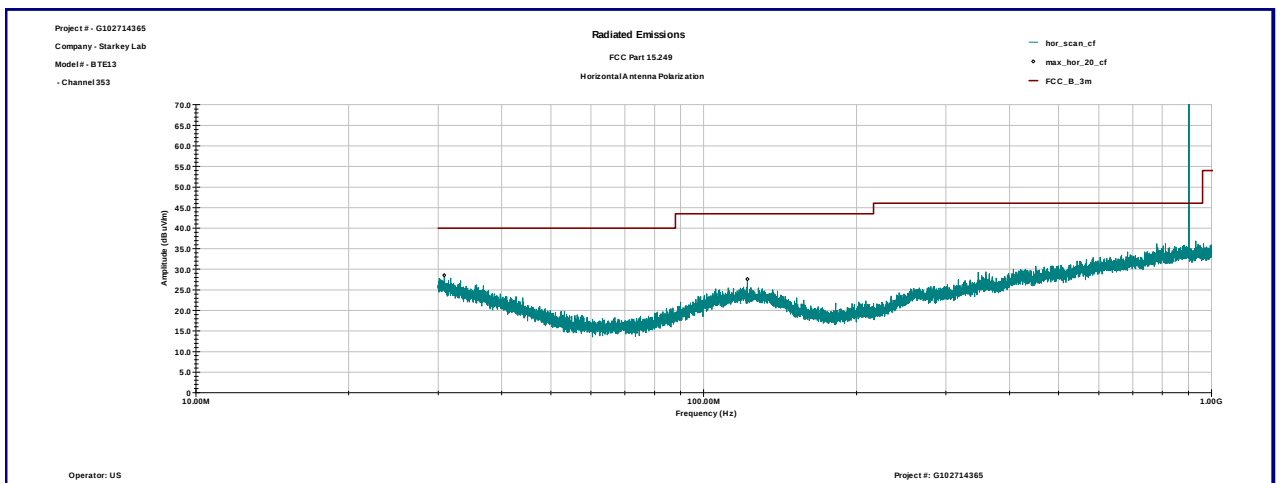


Graph 3.2.1

Vertical antenna polarization



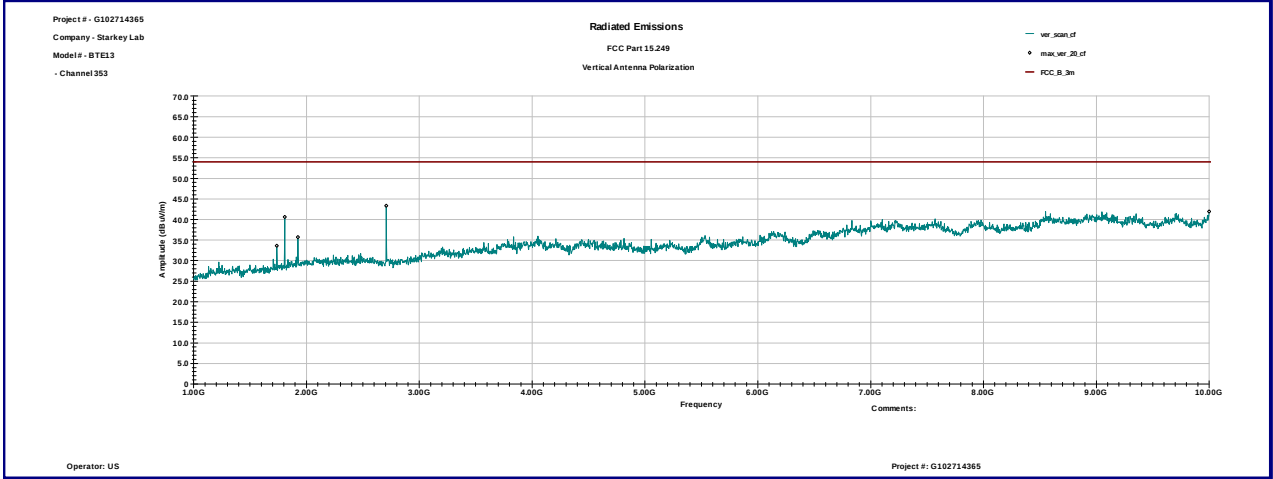
Horizontal antenna polarization



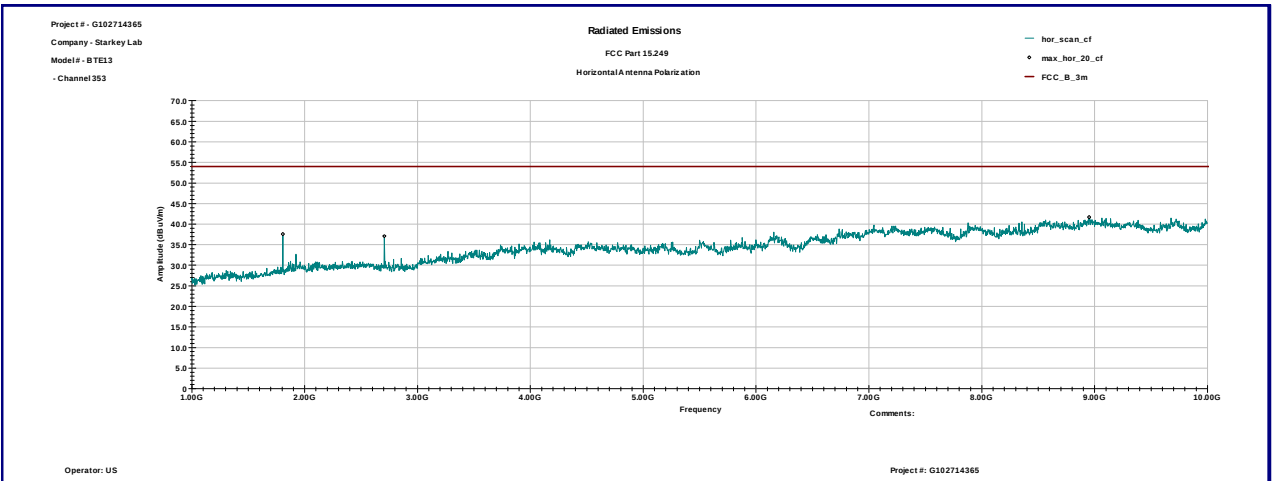


Graph 3.2.2

Vertical antenna polarization

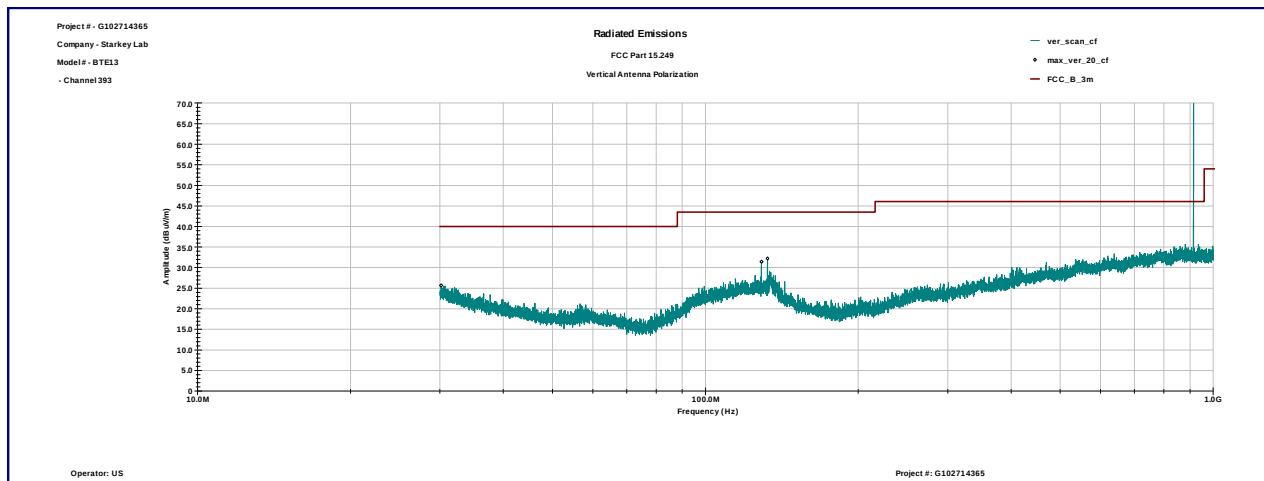


Horizontal antenna polarization

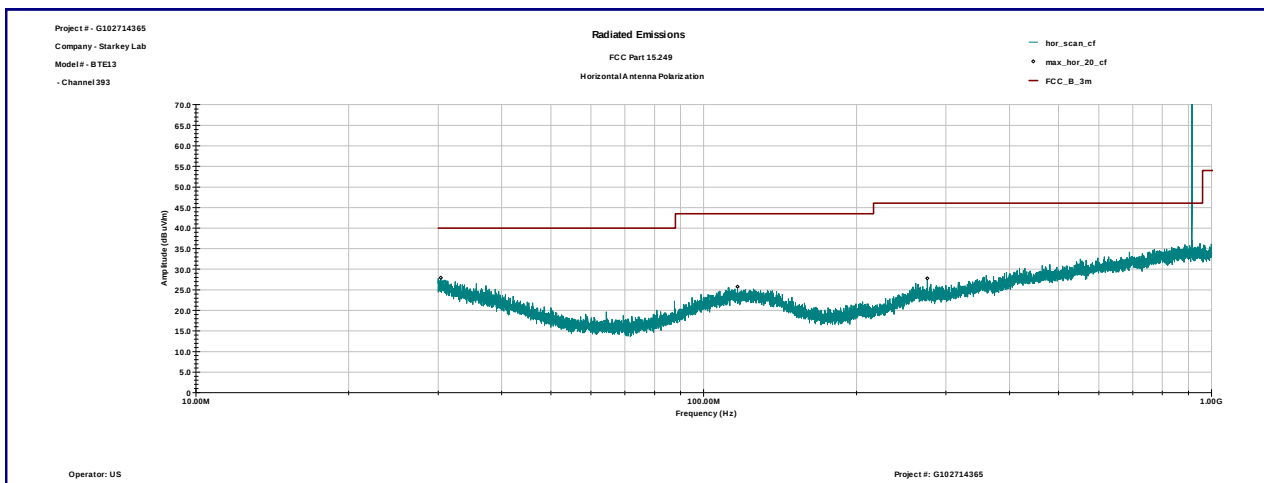


Intertek
Graph 3.2.3

Vertical antenna polarization



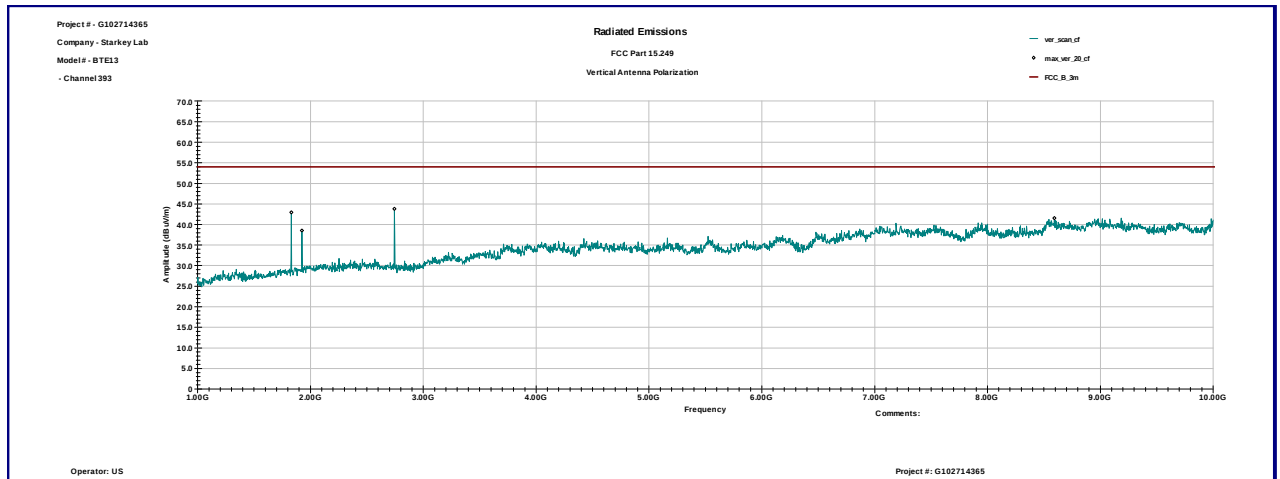
Horizontal antenna polarization



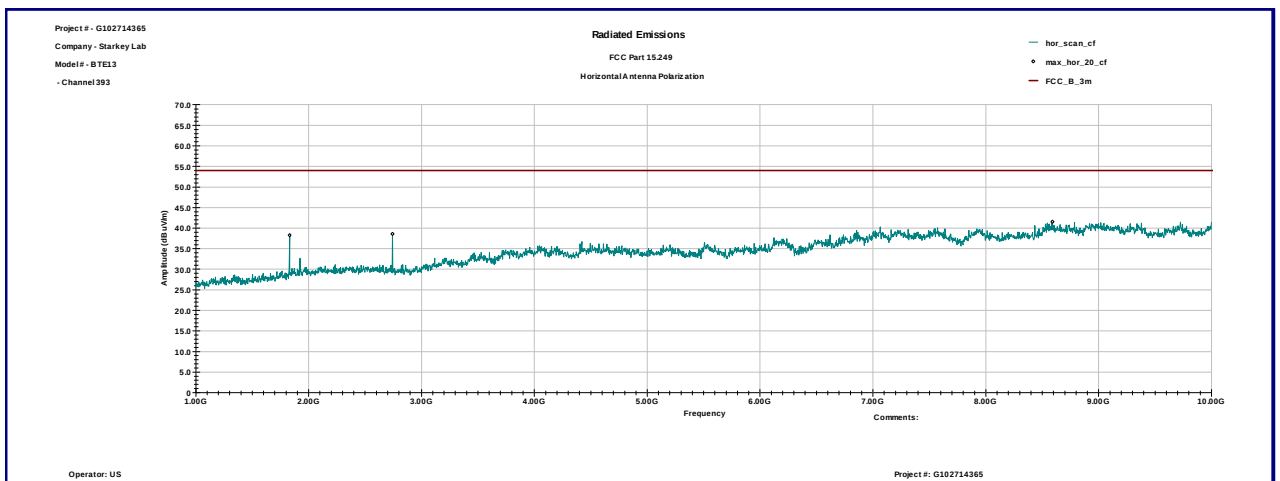
Intertek

Graph 3.2.4

Vertical antenna polarization

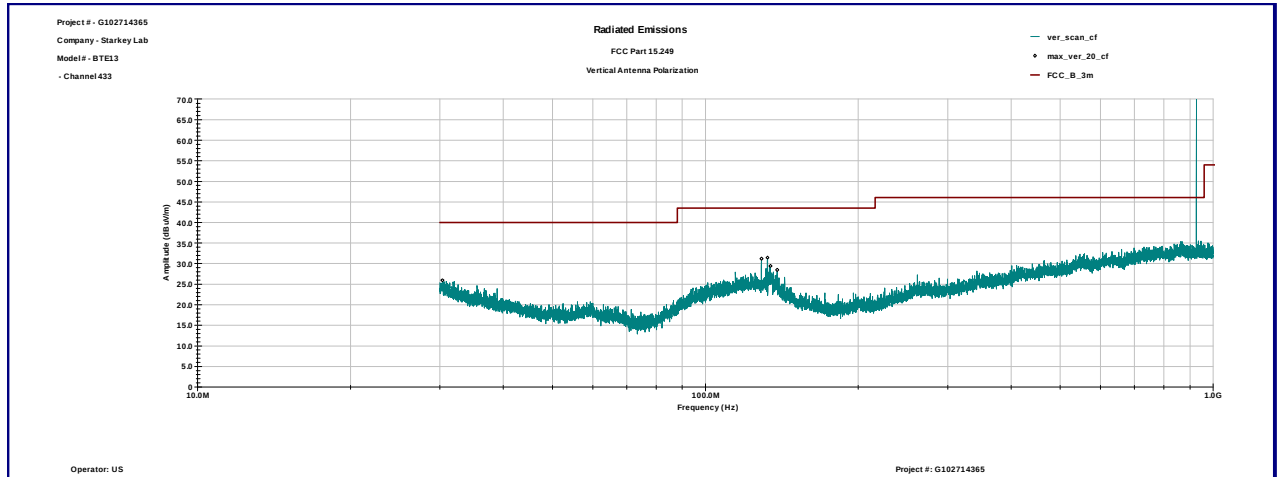


Horizontal antenna polarization

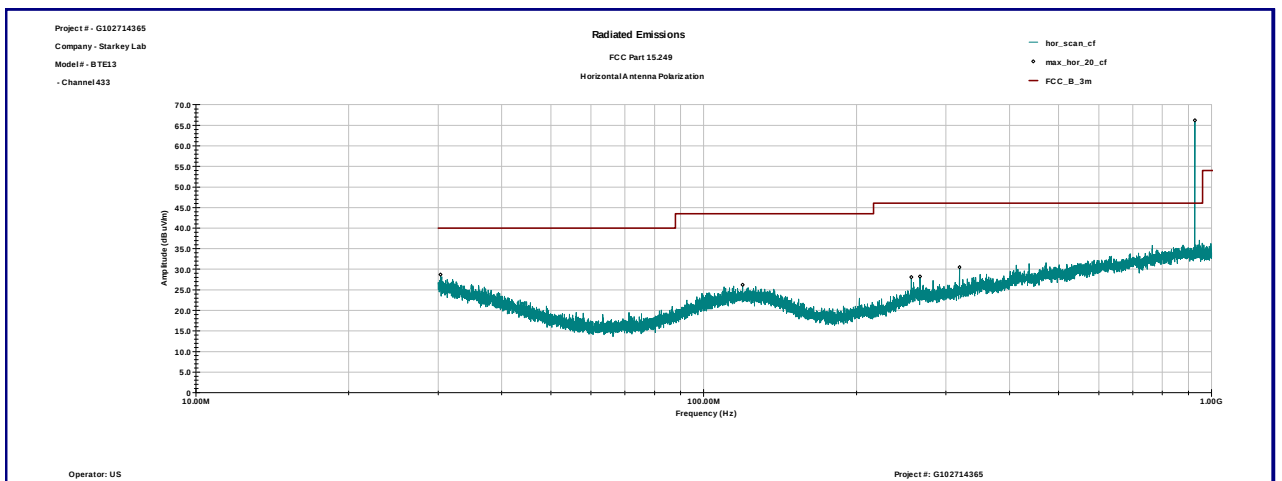


Intertek
Graph 3.2.5

Vertical antenna polarization



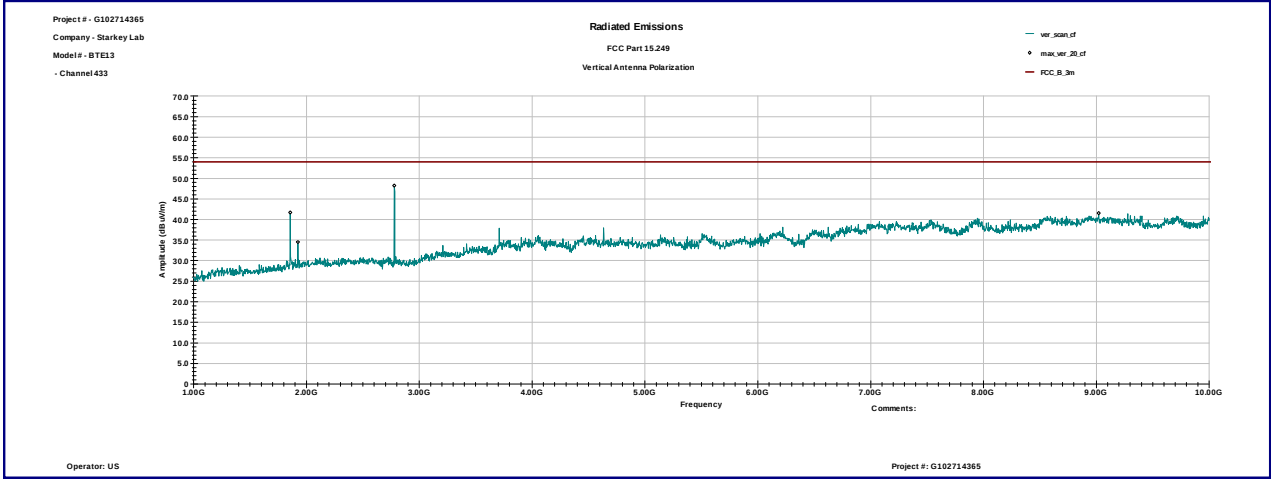
Horizontal antenna polarization



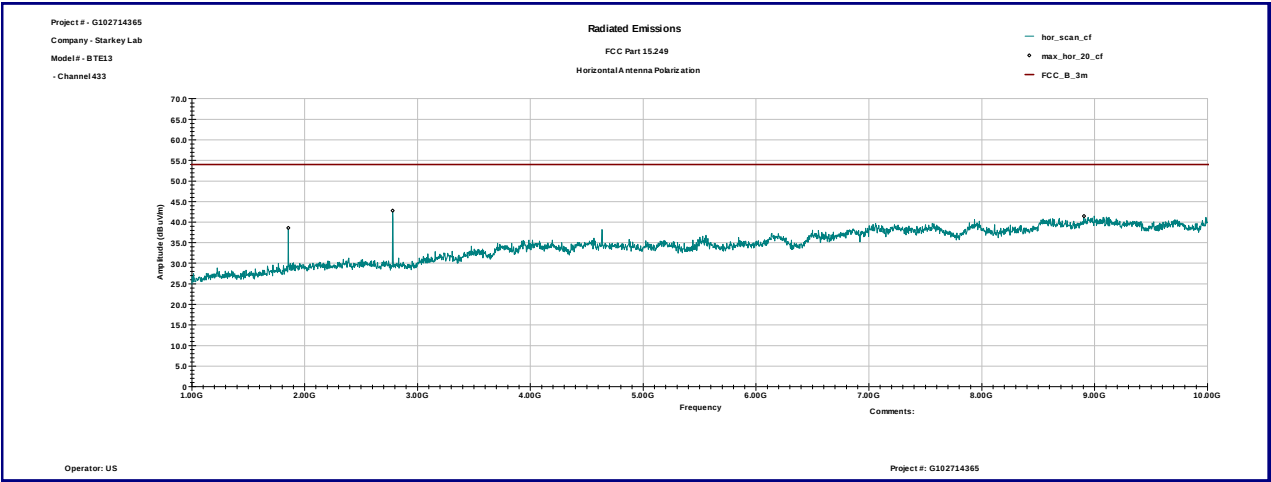
Intertek

Graph 3.2.6

Vertical antenna polarization



Horizontal antenna polarization





4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	01/20/2017	☒
Spectrum Analyzer	R & S	ESU	100398	25283	02/11/2017	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	09/24/2016	☒
Horn Antenna	EMCO	3115	9507-4513	9936	07/12/2017	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1402232	172081	11/19/2016	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	☒
High pass filter	Reactel	7HS-1G-S12	SN02-1	6015275	VBU	☒



5.0 Revision History

REVISION LEVEL	DATE	REPORT NUMBER	PREPARED	REVIEWED	NOTES
0	09-01-2016	102714365MIN-001	US	NS	Original Issue